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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/791,538	03/03/2004	Takashi Suda	Q79638	3357

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WASHINGTON, DC 20037

EXAMINER
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KAYRISH, MATTHEW

ART UNIT	PAPER NUMBER
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2627

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/22/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

# Office Action Summary

Application No.

10/791,538

Applicant(s)

SUDA, TAKASHI

Examiner

Matthew G. Kayrish

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 28 December 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-31 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-31 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 03 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Response to Arguments***

Applicant's arguments with respect to claim 1 have been considered. Claim 1 has been amended. The grounds of rejection remain.

Regarding the arguments to claim 1 that Hirano et al does not disclose a DLC layer provided on the substrate, as newly claimed in claim 1. Hirano et al does in fact disclose a DLC layer provided directly on the substrate, as noted in the 103 rejection, *infra*.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirano et al (US Patent Number 5986857).

Regarding claim 1, Hirano et al discloses:

A magnetic head comprising a film comprised of diamond-like carbon (figure 7, item 20) (hereinafter, referred to as "diamond-like carbon film") between a substrate (figure 7, item 1) and an insulating layer (figure 7, item 21);

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The diamond-like carbon film is provided directly on the substrate (column 1, lines 23-26).

Hirano et al, in the embodiment of figure 7, fails to specifically disclose:

Wherein said film has a Vickers hardness equal to or greater than  $2000 \text{ kg/mm}^2$  (column 11, lines 59-62).

Hirano et al, in the embodiment of figure 1, discloses:

Wherein said film has a Vickers hardness equal to or greater than  $2000 \text{ kg/mm}^2$  (column 11, lines 59-62).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the disclosed prior art of Hirano et al with a DLC layer having a Vickers Hardness greater than  $2000 \text{ kg/mm}^2$ , as taught by Hirano et al, because DLC is excellent in thermal conductivity which will prolong the life of the MR element, as noted in column 2, lines 54-59.

Regarding claim 3, Hirano et al disclose:

Wherein said film has a thickness equal to or greater than 100 nm (column 4, lines 65-67 & column 5, lines 1-6).

Regarding claim 4, Hirano et al discloses:

Wherein said magnetic head is a magnetoresistive head (figure 7, item 5).

Claims 5-7, 12, 17-21, 24, 26 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirano et al, in view of Hirano et al (US Patent Number 5901021).

Regarding claim 5, Hirano et al '857 disclose the features of base claim 1 as stated in the 102 rejection above, and further discloses:

The magnetic head according to claim 4, wherein the diamond-like carbon film, (figure 1, item 55) the insulating layer (figure 1, item 58), a lower shield layer (figure 1, item 53), a lower gap layer (figure 1, item 54), a magnetoresistive element (figure 1, item 56), an upper gap layer (figure 1, item 59), an upper shield layer (figure 1, item 60) are provided on one side surface of the substrate (figure 1, item 51):

Hirano et al '857 fails to disclose:

A protective layer;

Wherein the diamond-like carbon film, the insulating layer, a lower shield layer, a lower gap layer, a magnetoresistive element, an upper gap layer, an upper shield layer and a protective layer and are provided in this order on one side surface of the substrate.

Hirano et al '021 disclose:

Wherein the diamond-like carbon film (figure 6, item 52), the insulating layer (figure 6, item 53), a lower shield layer, a lower gap layer, a magnetoresistive element (figure 1, item 120), an upper gap layer, an upper shield layer, and a protective layer (figure 1, item 13) are provided in this order on one side surface of the substrate (figure 1, item 2).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the multilayer film insulative layer of Hirano et al '021, in the MR sensor of Hirano et al '857, to replace the insulative layer [52], because

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the multilayer DLC film layer of Hirano et al are very hard and will not smear or wear, thus, protecting the layers above it. This is stated in column 2, lines 25-31.

Regarding claim 6, Hirano et al '857 and Hirano et al '021 disclose the features of base claim 5 as stated in the 103 rejection above, and Hirano et al '857 further discloses:

Wherein said substrate is comprised of a nonmagnetic material (column 6, line 30).

Regarding claim 7, Hirano et al '857 and Hirano et al '021 disclose the features of base claim 6 as stated in the 103 rejection above, and Hirano et al '857 further discloses:

Wherein said nonmagnetic material is AlTiC ( $\text{Al}_2\text{O}_3\text{-TiC}$ ) (column 6, line 30),  $\alpha\text{-Fe}_2\text{O}_3$  ( $\alpha\text{-hematite}$ ),  $\text{NiO-TiO}_2\text{-MgO}$ ,  $\text{TiO}_2\text{-CaO}$ , or  $\text{NiO-MnO}$ .

Regarding claims 12 and 26, Hirano et al '857 discloses the features of base claim 1 as stated in the 102 rejection above, but fails to specifically disclose:

Wherein said insulating layer has a thickness ranging from 15 to  $30\mu$ .

Hirano et al '021 disclose:

Wherein said insulating layer has a thickness ranging from 15 to  $30\mu$  (column 2, lines 1-6).

Regarding claims 17 and 31, Hirano et al '857 discloses the features of base claim 1 as stated in the 102 rejection above, but fails to specifically disclose:

Wherein said protective layer has a thickness ranging from 2 to  $6\mu$ .

Hirano et al '021 disclose:

Wherein said protective layer has a thickness ranging from 2 to 6  $\mu$  (column 8, lines 38-42).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have, in the course of routine engineering optimization/experimentation, to fabricate a magnetic head with corresponding layers within the given ranges. Moreover, absent a showing of criticality, i.e., unobvious or unexpected results, the relationships set forth in claims 12, 17, 26 and 31 are considered to be within the level of ordinary skill in the art.

Additionally, the law is replete with cases in which the mere difference between the claimed invention and the prior art is some range, variable or other dimensional limitation within the claims, patentability cannot be found.

It furthermore has been held in such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range(s); see *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Moreover, the instant disclosure does not set forth evidence ascribing unexpected results due to the claimed dimensions; see *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338 (Fed. Cir. 1984), which held that the dimensional limitations failed to point out a feature which performed and operated any differently from the prior art.

Regarding claims 18 and 19, Hirano et al '857 and Hirano et al '021 disclose the features of base claim 5, as noted in the 103 rejection above, and Hirano et al '857 further disclose:

Wherein the substrate is comprised of a nonmagnetic material (column 6, line 30), and the diamond-like carbon film, the insulating layer comprised of an insulating material (column 6, lines 29 & 30), a lower shield layer comprised of a magnetic material (column 6, lines 30 & 31), a lower gap layer comprised of a nonmagnetic material (column 6, lines 35-37), a magnetoresistive element (column 6, lines 38-40), an upper gap layer comprised of a nonmagnetic material (column 6, lines 46-48), an upper shield layer comprised of a magnetic material (column 6, lines 49-51).

Hirano et al '857 fails to specifically disclose:

A protective layer comprised of an insulating material.

Hirano et al '021 disclose:

A protective layer comprised of an insulating material (column 6, lines 16-18).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to make the protective layer out of an insulating material, as taught by Hirano et al '021, because an insulative protective layer will provide insulating effects to prevent external magnetic field influence.

Regarding claim 20, Hirano et al '857 and Hirano et al '021 disclose the features of base claim 18, as noted in the 103 rejection above, and Hirano et al '857 further disclose:

The magnetic head according to claim 18, wherein said insulating layer is comprised of alumina ( $\text{Al}_2\text{O}_3$ ) (column 6, line 28), silica ( $\text{SiO}_2$ ), AlN, Al--N--X (where X denotes one or more of Si, B, Cr, Ti, Ta and Nb), SiN, SiC, DLC, BN, MgO, SiAlON, AlON,  $\text{Si}_3\text{Na}$ , SiCO, SiON, or SiCON.



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Regarding claim 21, Hirano et al '857 and Hirano et al '021 disclose the features of base claim 18, as noted in the 103 rejection above, and Hirano et al '857 further disclose:

The magnetic head according to claim 18, wherein said lower shield layer and said upper lower shield layer are respectively comprised of Fe--Si--Al alloy (Sendust), Ni--Fe alloy (Permalloy) (column 6, line 29), or Ni--Zn alloy (hematite).

Regarding claim 24, Hirano et al '857 fails to specifically disclose:

The magnetic head according to claim 18, wherein said protective layer is comprised of alumina ( $\text{Al}_2\text{O}_3$ ) or silica ( $\text{SiO}_2$ ).

Hirano et al '021 et al disclose:

The magnetic head according to claim 18, wherein said protective layer is comprised of alumina ( $\text{Al}_2\text{O}_3$ ) or silica ( $\text{SiO}_2$ ) (column 1, lines 16-18).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide Hirano et al '857 with a protective layer of alumina, because this is a well known material for protective layers, as noted by Hirano et al in column 1, lines 16-18.

Claims 11, 13-16, 25 and 27-30 rejected under 35 U.S.C. 103(a) as being unpatentable over Hirano et al '857 and Hirano et al '021 as applied to claim 5 above, and further in view of Hayashi et al (US Patent Number 6490139).

Regarding claims 11 and 25, Hirano et al '857 and Hirano et al '021 fail to specifically disclose:

Wherein said substrate has a thickness ranging from 60 to 100  $\mu$ .

Hayashi et al disclose:

Wherein said substrate has a thickness ranging from 60 to 100  $\mu$  (column 26, lines 51-54).

Hayashi et al disclose:

Regarding claims 13 and 27, Hirano et al '857 and Hirano et al '021 fail to specifically disclose:

Wherein said lower shield layer has a thickness ranging from 2 to 4  $\mu$ .

Hayashi et al disclose:

Wherein said lower shield layer has a thickness ranging from 2 to 4  $\mu$  (column 26, lines 11-12).

Regarding claims 14 and 28, Hirano et al '857 and Hirano et al '021 fail to specifically disclose:

Wherein said upper shield layer has a thickness ranging from 2 to 4  $\mu$ .

Hayashi et al disclose:

Wherein said upper shield layer has a thickness ranging from 2 to 4  $\mu$  (column 26, lines 40-42).

Regarding claims 15 and 29, Hirano et al '857 and Hirano et al '021 fail to specifically disclose:

Wherein said lower gap layer has a thickness ranging from 60 to 140 nm.

Hayashi et al disclose:

Wherein said lower gap layer has a thickness ranging from 60 to 140 nm (column 26, lines 43-44).

Regarding claims 16 and 30, Hirano et al '857 and Hirano et al '021 fail to specifically disclose:

Wherein said upper gap layer has a thickness ranging from 80 to 160 nm.

Hayashi et al disclose:

Wherein said upper gap layer has a thickness ranging from 80 to 160 nm (column 26, lines 47-48).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have, in the course of routine engineering optimization/experimentation, to fabricate a magnetic head with corresponding layers within the given ranges. Moreover, absent a showing of criticality, i.e., unobvious or unexpected results, the relationships set forth in claims 11-17 and 25-31 are considered to be within the level of ordinary skill in the art.

Additionally, the law is replete with cases in which the mere difference between the claimed invention and the prior art is some range, variable or other dimensional limitation within the claims, patentability cannot be found.

It furthermore has been held in such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range(s); see *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Moreover, the instant disclosure does not set forth evidence ascribing unexpected results due to the claimed dimensions; see *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338 (Fed. Cir. 1984), which held that the dimensional limitations failed to point out a feature which performed and operated any differently from the prior art.

Claims 8 and 9 rejected under 35 U.S.C. 103(a) as being unpatentable over Hirano et al '857 and Hirano et al '021 as applied to claim 5 above, and further in view of Postma et al (US Patent Number 5764453).

Regarding claims 8 and 9, Hirano et al '857 and Hirano et al '021 fail to specifically disclose:

Wherein said substrate is comprised of a magnetic material.

Postma et al disclose:

Wherein said substrate is comprised of a magnetic material (column 3, lines 4-14).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the substrate of Hirano et al '857 with a magnetic substrate, as taught by Postma et al, because the magnetic substrate will serve as a magnetic flux guide. Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the substrate of Hirano et al '857 with a magnetic substrate made of the aforementioned materials, as taught by Postma et al, because these materials will help stabilize the MR element from external magnetic fields. This is noted in column 3, lines 4-14.

Claims 11, 13-16, 25 and 27-30 rejected under 35 U.S.C. 103(a) as being unpatentable over Hirano et al '857 and Hirano et al '021 as applied to claim 5 above, and further in view of Lau (US Publication Number 2003/0214745), in even further view of Xue et al, (US Patent Number 6144534).

Regarding claims 10 and 23, Hirano et al '857, in view of Hirano et al '021 fail to disclose:

Wherein said magnetoresistive element is a magnetoresistive element comprising a lower layer in the form of a tantalum layer, a SAL bias layer in the form of a NiFeNb layer, an intermediate insulating layer in the form of a tantalum layer, a magnetoresistive layer in the form of a NiFe layer, and an upper layer in the form of a tantalum layer in this order.

Lau discloses:

Wherein said magnetoresistive element is a magnetoresistive element (page 6, paragraph 40) comprising a lower layer in the form of a tantalum layer (figure 6, item 650), a SAL bias layer (figure 6, item 640), an intermediate insulating layer in the form of a tantalum layer (figure 6, item 630), a magnetoresistive layer in the form of a NiFe layer (figure 6, item 620), and an upper layer in the form of a tantalum layer in this order (figure 6, item 610).

Lau fails to disclose:

A SAL bias layer in the form of a NiFeNb layer.

Xue et al disclose:

A SAL bias layer in the form of a NiFeNb layer (column 4, lines 64-67).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to create this make up of an MR sensor, as this is a very good thermosensor for repeatability, accuracy and linearity. This is noted in Lau, paragraphs 40 & 41. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to make the soft adjacent layer of NiFeNb, as taught by Xue et al, because NiFeNb has recording properties which suppress spike noise, and linearly increase recording density without increasing the coercivity.

Claims 11, 13-16, 25 and 27-30 rejected under 35 U.S.C. 103(a) as being unpatentable over Hirano et al '857 and Hirano et al '021 as applied to claim 18 above, and further in view of Ikarashi et al (US Patent Number 6326092).

Regarding claim 22, Hirano et al '857, in view of Hirano et al '021 fail to specifically disclose:

The magnetic head according to claim 18, wherein said lower gap layer and said upper gap layer are respectively comprised of alumina ( $\text{Al}_2\text{O}_3$ ) or silica ( $\text{SiO}_2$ ).

Ikarashi et al disclose:

The magnetic head according to claim 18, wherein said lower gap layer and said upper gap layer are respectively comprised of alumina ( $\text{Al}_2\text{O}_3$ ) or silica ( $\text{SiO}_2$ ) (column 11, lines 45-52).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide Hirano et al '857 with gap layers made of

alumina, because alumina is a well known for its properties to protect the MR sensor because of its hardness and furthermore, insulate the MR sensor from exterior magnetic fields.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew G. Kayrish whose telephone number is 571-272-4220. The examiner can normally be reached on 8am - 5pm M-F.

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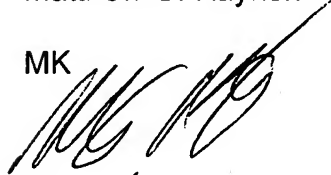
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wayne Young can be reached on 571-272-7582. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Matthew G. Kayrish

3/10/2007

MK

  
3/10/2007  
ANDREA WELLINGTON  
SUPERVISORY PATENT EXAMINER